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III. *Experiments on some Mineral Substances.* By Peter Woulfe, F. R. S. Communicated at the Desire of William Hunter, F. R. S. and Physician extraordinary to the Queen.

Read Nov. 19, 1778.

On crystal, quartz, and flint.

MONS. BEAUMÉ, a member of the Royal Academy of Sciences of Paris, has asserted, that he obtained allum from crystal, quartz, and flint. His method to obtain allum from these substances was to make a *liquor silicum*, by melting them in a crucible with fixed alkaly, and letting the mixture run *per deliquium*; any acid added to this *deliquium* precipitates the crystal, quartz, or flint, which, by means of acid of vitriol, he dissolved, and obtained allum. I have often repeated this operation on all these substances, but could never obtain a single grain of allum: in lieu thereof I got a felenite, and was on that account convinced, that the basis of these substances was a calcareous earth. Mr. BEAUMÉ's mistake was, I am certain, owing to the Paris crucibles which he

made use of, and which, for want of being well burnt, retained yet their clayey nature; consequently a portion, and that not a small one, of the clay, is dissolved by the alkaly; allum must therefore in his manner be obtained, as clay is the matrix, or at least contains the earth of allum. It is rather a tedious operation to make the *liquor silicum*, and especially in any quantity; for the mixture is very subject to froth and boil up in the crucible, and the operation is not compleat until this boiling up ceases, and the mixture melts thin. Hence it is natural to conclude, that a large portion of the clay of a Paris crucible is dissolved by the alkaly during this long operation.

In order to discover whether the crystal, quartz, or flint, contained any acid, I put in practice the method which I published in my last paper on mineral substances, to discover the acids of horn silver and horn mercury; but I could not find they contained any.

On the change of crystal into selenitical spar.

The crystal on which I tried the following experiments, and which is partly changed into selenitical spar, is to be found in that most excellent museum collected by Dr. HUNTER. This crystal comes from near Freyberg in Saxony, and is called in German *nieren-formiger crystal*

Sal (kidney-formed crystal). It is in the form of an uneven crust, with small protuberances; a part of it retains all the appearances of crystal, but the rest is opaque, somewhat of an ash colour, and is easily powdered: the underpart retains marks of *galena* or potter's lead ore, and in some specimens the greatest part is coated with it.

I took three drams of the opaque part of this crystal finely powdered, and mixed it with an equal quantity of fixed alkaly of cream of tartar, and in order to facilitate the union, the mixture was made into a paste with distilled water, then dried and calcined for an hour as in my experiments on horn silver (see Phil. Trans. vol. LXVI. p. 604.). The mixture was then taken out of the phial powdered, and, by digestion with distilled water at three different times, deprived of its saline part: these three solutions were mixed together, saturated with distilled vinegar, evaporated to dryness and washed well with rectified spirit of wine. By this means 3j. and gr. vi. of tartar of vitriol was obtained. The undissolved part, remaining after digestion with water, when dried weighed 3ij. and gr. xxiv.; this was mixed and digested with pure acid of nitre, and effervesced strongly. After this digestion the undissolved part here remaining, being well washed and dried, weighed 3j. and gr. xv. which I take to be crystal, for no saline matter was obtained by treating

it with acid of vitriol; and hence it appears, that nearly two-thirds of the crystal is changed into selenitical spar. The solution which was obtained by the acid of nitre mixed with acid of vitriol, but especially with a solution of tartar of vitriol, precipitates copiously, and forms a selenite. This evidently proves the existence of the calcareous earth, and the tartar of vitriol mentioned above, that of the acid of vitriol in this altered crystal.

The unaltered part of this crystal, treated in the same manner as the altered part, afforded no marks of selenitical spar.

The change of this crystal is, I suspect, owing to the lead ore which adheres to it; the sulphur of the lead ore furnishing the acid of vitriol, and the crystal the calcareous earth.

I have in the above manner treated a variety of the heavy spars, commonly called selenitical or gypseous spars, and found them all, as I first judged by their appearance and great weight (without being once mistaken) to consist of acid of vitriol, with calcareous earth and some clayey matter. In some, the calcareous earth was combined with a larger portion of this acid than in others; and in some, the clayey matter was predominant. Among these were the following, some of which were not before taken for selenitical spars.

The Derbyshire and Eckton cauk, which is commonly covered with copper marcaffite.

Ditto from Saxony, which is found growing like knobs or protuberances on the yellow phosphoric spars.

The *spatium ericæ forme* of Woodward from Derbyshire.

The stellated spar, which is found on the *ludus belmontii* from the island of Sheppy.

The spar from Saxony, resembling lead ore, and which by many is supposed to be one, called in German *flangen spatb.* This spar is by Baron BORN classed with the basaltés; he has no doubt taken it for a shirl, which is classed with the basaltés, but I never found them to have any affinity.

Another spar from Saxony, called also *flangen spatb.*, composed of large interwoven prisms, partly red and partly white, and semi-transparent.

Compact semi-transparent Auvergne spar, said by M. MONET to contain sulphur; but I could never find an atom of it in this or in any of the other spars I tried, and suppose his mistake to be owing to a portion of charcoal, flame of charcoal, or dust, that got into the crucible. Native sulphur is frequently found growing with calcareous spar and gypsum, but it should be considered as heterogeneous.

Flaky milk-white spar, found with Cobalt and copper ores from Saalfeld.

Two spars from the Hartz, composed of flakes and crystallized.

Ditto from Saxony.

Striated spar from Scotland, brought here by Mr. GOAN.

Spar intermixed with cinnabar and ochre of iron from Obermoschel in the dutchy of Deux Ponts.

Red ochry compact spar from Derbyshire.

I shall give a few of my experiments on these substances compared with the common Paris montmartre plaster stone; all these were deprived of their humidity before they were submitted to trial.

Two drams of the Paris plaster stone, treated as in the former experiment, with an equal quantity of alkaly of tartar, produced $\frac{3}{4}$ jff. and gr. viii. of tartar of vitriol^(a).

The insoluble part remaining after being deprived of its saline part by water, was digested with distilled vinegar, which effervesced and dissolved the whole of it, except a small portion, which, when washed and dried, weighed gr. vi. and had the appearance of tobacco-pipe clay. Had I taken a pure white transparent gypsum, I believe that no sediment would have been left. From

(a) The tartar of vitriol, of all the trials I make mention of in this paper, was dissolved in distilled water, and mixed with a solution of calcareous earth in acid of salt, which caused a copious selenitical precipitation, a clear demonstration of the existence of the acid of vitriol.

this experiment it appears, that gr. xcvi. of vitriol was produced by gr. cxiv. of pure gypsum, for the gr. vi. of clayey matter must be deducted,

The like quantity of Derbyshire cauk, treated in the same manner, produced gr. lix. of tartar of vitriol, and the clayey matter, which exactly resembled the former, weighed gr. xxiii.

The stellated spar from the island of Sheppy, submitted in the same proportion to the same trials as the foregoing, produced gr. lviii. of tartar of vitriol, and gr. xxii. of clayey matter, which was whiter than in the former.

WOODWARD'S *erica* formed spar in the like proportion and manner as the former, afforded gr. xxxviii. of tartar of vitriol, and gr. xlii. of clayey matter.

To shew that the calcareous earth in the gypsum contained a greater portion of acid of vitriol than that in the felenitical spars, I reasoned thus, having previously subtracted the clayey matter of each.

If 114 grains of plaster (the 6 grains of clay being deducted) afford 98 grains of tartar of vitriol, how much should 97 grains of the gypseous matter contained in cauk afford (for the clayey substance must also here be subtracted). From this rule it should produce $83\frac{12}{57}$ grains of tartar of vitriol, and nevertheless the quantity

was only 59 grains. Hence it is clear, that the calcareous earth of the gypsum contains a greater proportion of acid of vitriol than that of the cauk.

According to this rule, the stellated spar from Sheppy should have afforded $84\frac{14}{57}$ grains of tartar of vitriol, but it produced only 58 grains.

The *erica*, formed spar by the same rule, should have afforded $65\frac{17}{57}$ grains of tartar of vitriol, but the quantity was only 38 grains.

As I suspected that the selenitical spars contained some calcareous earth, not united to the acid of vitriol, I digested some of them with rectified pure acid of nitre, and afterwards well washed and dried them; but the loss of weight was very trifling, except in the cauk and *erica* formed spar; the first probably containing some marcasfital particles of copper, and the last an ochre of iron.

Dr. LEWIS, in his translation of NEWMAN'S Chemistry, quotes from the Philosophical Transactions somewhat remarkable about cauk, that when wetted with antimony it gives it a shining surface like steel.

I repeated the experiment as follows: I powdered and mixed ℥ ff. of cauk with ℥ iij. of antimony, and put the mixture into a red hot crucible; and when melted, which readily happens, I stirred it with an iron rod, and poured
it

it into an iron mortar. This matter in its fracture has appearances of RULANDUS's false liver of antimony.

I have also tried, in the same proportion and manner, the following substances, and found the effects so much alike, that they could be scarcely distinguished one from the other.

Stellated spar, from the island of Sheppy,

Auvergne compact plated spar.

Erica formed spar.

Whited plated gypsum dried.

Dried whiting.

Fixed alkaly of tartar.

Hence we may conclude, that the calcareous earth of these spars and gypsum act on the antimony like fixed alkaly, forming a sort of liver of antimony.

Of some mineral substances which contain the earth of allum.

Tobacco-pipe clay, of all substances I know, would be the fittest to make allum with, was it necessary; but nature has supplied it abundantly in other bodies, from which it is obtained with little art and expence.

Two drams of dried tobacco-pipe clay, treated with an equal quantity of fixed alkaly of tartar, as in the last ex-

periments, produced no tartar of vitriol; nor have I been able to obtain any from the other clays, which I submitted to the same trials: such were the porcellane clay from Cornwall, the porcellane clay from Saxony, Sturbridge clay, fuller's earth, as also the blue argilla from Paris, which M. BEAUME says is replete with the acid of vitriol^(b), and to that he attributes its property of setting free the acids of salt petre and of sea salt; but of this more fully hereafter.

The tobacco-pipe clay, having been deprived of its saline part after the calcination, was as white as chalk, and had lost its tenacity^(c). It increased in weight gr. viii. and the alkaly was not only diminished in weight, but was also combined with a portion of the clay; for, on saturating it with distilled vinegar, a gelatinous substance was separated. I have often observed the formation of this gelatinous matter on the surface of the Vauxhall stone bottles, in which I had kept for some months

(b) M. BEAUME, in order to demonstrate the acid of vitriol in the clay, has boiled it for a considerable time with fixed alkaly, and thereby obtained tartar of vitriol: had he made use of a pure alkaly, I would take upon me to say, that his experiment would have failed. The alkaly he used contained already tartar of vitriol, which became more manifest by long boiling, as a portion of the alkaly combines with the clay.

(c) Might not this be substituted in the room of white lead for painters use, the white lead having many bad qualities, and being very injurious to some other colours?

oil

oil of tartar, *per deliquium*. This ware is made with tobacco-pipe clay and sand, and when well burnt is not acted on by either acids or alkalies.

This shews the union of clay with alkalies, and that may be the chief reason why it should, when helped with heat, be so useful in obtaining the acids of nitre and of sea salt. I have also obtained this gelatinous substance by mixture of tobacco-pipe clay and oil of tartar, *per deliquium*; for after some months, the alkaly being dissolved with water and evaporated, had in great part a gelatinous consistence. This mixture was stirred now and then, and had a remarkable volatile alkaline smell. Mr. BOYLE says, that clays distilled with sea salt produces a *sal ammoniac*, and I found it to be always true when the distillation is at first slowly conducted.

I have often made allum with tobacco-pipe clay calcined with oil of vitriol, but kept no notes of the quantity I obtained; and as for the *residuum* used in this experiment, it was lost. I can, however, tell the quantity of allum which the porcellane clay from Cornwall affords. Two drams of this clay, which had been treated with its weight of fixed alkaly, and deprived of its saline part, then calcined four different times, with a fresh portion each time of oil of vitriol, produced $\frac{3}{4}$ fl. and gr. xxiv. of good.

good crystallized allum^(d). The fourth calcination afforded no allum, and what remained, after being dried and washed, weighed gr. lv. What this matter is I have not yet tried; perhaps it may be of the quartz kind. Hence it appears, that this clay contains half its weight of earth of allum, which, by its union with the acid of vitriol and the water that enters into its crystallization, produces better than four times its weight of allum, and therefore this clay treated with acid of vitriol affords more than double its weight of allum.

Of Feld spar.

The honourable Mr. GREVILLE, a member of the Royal Society, and remarkable for his taste and skill in natural history, as well as for his judicious remarks on the nature, growth, and formation of minerals, has in his travels made some very interesting observations on the formation of Feld spar; the specimens which he collected on the spot shew evidently the change of clay into this spar, and also the different gradations of the change.

(d) The celebrated Mr. MARGRAF, to whom the discovery of making allum with *argilla* and acid of vitriol is due, could not obtain the allum in a crystallized state without the addition of some fixed alkaly. His mistake was owing to the excess of acid of vitriol, which the alluminous earth of the clay retained for want of sufficient heat, and which he corrected by saturating it with an alkaly.

The

The Feld spar I made use of was given me by that most excellent chemist, M. ROUELLE of Paris, and I think he told me it came from Alençon.

In order to make allum of it, I melted $\frac{3}{4}$ j. of it with $\frac{3}{4}$ j. ff. of fixed alkaly of cream of tartar, and let the mixture run *per deliquium*. This operation is as tedious and as troublesome to perform as the *liquor silicum* made with flint, quartz, or crystal, for it is as liable to froth and boil over. No neutral salt was here obtained. The *deliquium* with its dregs were mixed with distilled vinegar, which precipitated the spar: this precipitate, afteredulcoration and exsiccation, was calcined four different times, with fresh parcels each time of oil of vitriol, and afforded $\frac{3}{4}$ vij. and gr. xvi. of good and regularly crystallized allum; the part which afforded no more allum, when washed and dried, weighed $\frac{3}{4}$ j. and $\frac{1}{2}$ ij.

The Labradore stone ^(e) is also a Feld spar, though not so hard as the former. The like quantity of this, treated as the foregoing, gave no marks of neutral salt; the quantity of allum was $\frac{3}{4}$ j. $\frac{3}{4}$ j. and gr. xii.; and the un-

(e) This stone is only found on the Coast of Labradore, and was brought here by the direction of the Rev. Mr. LA TROBE, remarkable for his piety and zeal in propagating the gospel among the savage Indians. This stone reflects a variety of fine shining colours, such as blue, green, yellow, &c. I doubt not but that several other stones, which reflect various and changeable colours, upon trial will be found to be Feld spars.

dissolved part weighed $\frac{3}{4}$ v. and gr. xxxvi. This spar does not boil up in its fusion with the alkaly near so much as the other, and therefore the loss in the operation is trifling compared to it, and on that account it affords a greater proportion of allum.

Sbirl frequently, though erroneously, called basaltes.

The sbirl I tried is of a brown colour, forms a mass of long minute prisms closely adhering together, and comes from Bohemia. Its brown colour is owing to iron. This sbirl, treated in the same proportion and manner as the Feld spar, afforded no neutral salt. The quantity of allum was $\frac{3}{4}$ ij. $\frac{3}{4}$ j. and gr. xxiv.; but I must observe, that the two last crystallizations contained iron, and the mother water that remained was of an oily consistence, had a styptic taste, and resembled that obtained in making green copperas. The earthy matter here remaining weighed $\frac{3}{4}$ ij. and gr. lii ; was light and of a grey colour. Hence it is evident, that sbirl contains nearly as much earth of allum as the Cornish porcellane clay.

Mr. ILSEMAN, an ingenious apothecary and chemist at Clausthal in the Hartz, has assured me, that he obtained from pumice stone and sbirl a *sal catharticus amarus*. He has, I presume, made his trials on sbirl

which is found with lava, and is the product of a volcano. I had none of it to try, but judge it, from its appearance, to be of a different nature from that found in mines.

Allum is commonly obtained from slate, which for that purpose is calcined for a considerable time. I know no substance so replete with it as the Irish slate, *lapis Hybernicus* of the druggists; for this, without any calcination, affords allum.

Allum is likewise obtained from the earth or clay of Solfatara, and from the red slate found near Saarbruck; but these have been exposed, no one can tell how long, to the heat of volcanos. Iron always accompanies allum, and thence the use of some alkaly, by which means the red chalk (*rubrica fabrilis*) is obtained.

Of jasper.

Many of the jaspers, so called, owe their origin to crystal or quartz coloured with iron; perhaps in a few instances to copper. These, I dare say, treated as the former, would produce no allum; but I have only tried one of the Oberstein jaspers, and this had visible marks of crystal. Others of the jaspers, and these I call the true ones, are formed by clay and afford allum; such is the

Saxon jasper, called ribbon agate, as also a red one, which was given me as coming from Johngeorgenstadt. From those I obtained very good allum, but can give no account of the particulars, having lost the paper which contained the result of my experiments.

Yellow pitch stone, and wood like dale, petrified with pitch stone, both from Hungary.

The result of my experiments on these substances was set down on the same paper with that of the jaspers which was lost; but I recollect to have only obtained a small portion of allum, and for that purpose was obliged, before I obtained the allum well crystallized, to wash away the excess of acid with rectified spirit of wine.

Tin spar of the Germans, commonly called white tin ore.

It has a sparry appearance; but by its lamellated texture and great specific gravity, which is equal to that of tin grains, is easily known. This is supposed by several to be rich in tin; but the Saxon mineralogists assert, that it contains none. The only experiment I made with it was to digest it in a powdered state with acids, by which means it acquires a rich yellow colour, like turbith mi-

neral; the acid of salt answers best for this experiment. This is the only substance I know of which has this property.

Norway zoolite.

This substance, treated with fixed alkaly, as in the former experiments, afforded no neutral salt; and what remained, after the alkaly was washed away, treated with acids, formed the like gelatinous matter as it does in its crude state.

An account of such substances as have a sparry appearance, and how to distinguish the one from the other.

Crytal and quartz are easily known by their great hardness, and by the copious sparks of fire which they afford when struck with steel.

Feld spar is frequently so hard as to strike fire with steel, and to give copious sparks of fire; but its laminated texture, as well as its breaking into rhombs, makes it easily distinguished from crytal and quartz.

Phosphoric spar is easily known by the luminous appearance it has when heated, and also by the smell it

affords when added to oil of vitriol made hot, which exactly resembles that of acid of salt. It is found of various colours, as green, blue, purple, crimson, white, and also yellow. When crystallized it forms perfect cubes; the only exception I ever met with was a specimen of the green sort, which was sent me by Mr. SOPER, of St. Columb in Cornwall, who has distinguished himself by his skill in natural history and mineralogy. This specimen was composed of two quadrangular pyramids united together at their basis.

Selenitical spar is found crystallized in a great variety of forms; is heavier than the foregoing substance; does not effervesce or dissolve with acids, nor is it so hard as the phosphoric spar.

Calcareous spar is easily distinguished from other substances by its effervescences and solution in the acids of nitre and sea salt. Acid of vitriol, added to these solutions, causes a selenitical precipitation: this spar is neither so hard nor so heavy as the foregoing substances, and crystallizes in a great variety of forms.

Gypsum is lighter than any of the foregoing substances, and is so soft as to be easily scratched with one's nail; it does not effervesce nor dissolve with acids, and is the only substance that forms plaster when burnt; it crystallizes in a great variety of forms.

Mica or Glimmer. This is lighter than any of the sparry substances; is composed of very thin flexible flakes, more or less large. Many of this kind are found in form of small coloured scales of various colours, and very much resemble the bronzes.

Tin spar, or white tin ore, see its description heretofore.

White lead ore is found of a great variety of forms; is very heavy, effervesces with the acids of nitre and sea salt, and totally dissolves in them, with the help of heat. With the acid of salt it forms crystals much resembling a silver coloured glimmer, just as common lead would have done, and with the acid of nitre it forms regular crystals.

The spathose iron ores, when powdered and put on a red-hot iron or stone, instantly become black, and look like a black, shining, micaceous iron ore.

Zeolite is lighter than the calcareous spars: see its properties already described.

Of a set of spars whose properties were not hitherto known, and experiments made on one of them.

This spar crystallizes in form of flat, and also of solid, rhomboidal crystals, and is found of a great variety of colours, such as white and semi-transparent, of a pearl colour,

colour, reddish, and of different shades of brown and yellow, some of them being like gold, brass, and copper. It has always a peculiar gloss or brightness. May not the green and yellow glimmers from Johngeorgenstadt be of this kind?

The specimen I made use of for the following experiments is in Dr. HUNTER'S collection, and seemed to be well adapted for this purpose, it being perfectly free from any matrix or heterogeneous matter. The whole substance of it is a crust composed of rhomboids, which grow out of one another, and form a variety of cavities: its colour is white and semi-pellucid, and on one side there was a slight marcasitical coating. This substance comes from Joachimsthal, and is harder than any of those mentioned before, except the crystal, quartz, and field spar.

EXPERIMENT I.

Three drams of this spar, with an equal quantity of fixed alkaly of cream of tartar, melt with a moderate degree of tin; but the mixture soon becomes thick and cakes. It was after an hour's calcination suffered to cool, then was powdered and deprived of its saline part with boiling distilled water. This saline part, treated as in the
other

other experiments with distilled vinegar and rectified spirit of wine, gave no marks of neutral salt. The undissolved part after this operation dried, weighed ʒ ij. and gr. l.: this was mixed with oil of vitriol, which caused a strong effervescence, and then calcined, to be deprived of its excess of acid. It was now digested, at three different times, with distilled water, which dissolved a portion of it; what remained undissolved after this operation, being dried, weighed ʒ j. and gr. lii. and was a selenite, as will appear by further experiments. The three portions of water, with which this matter was digested, mixed together, then evaporated and crystallized, produced ʒ ij. and gr. xlv. of a white salt, mostly consisting of rhomboidal prisms, some lying flat and some erected sideways. This I judged, by its styptic taste, to contain iron, and by its white colour to contain a *sal catharticus amarus*, or at least a new earth, which with the acid of vitriol forms a soluble salt.

EXPERIMENT II.

This spar, in its crude state, effervesces strongly with oil of vitriol diluted with water. Three drams of the spar treated in this manner, and afterwards deprived by calcination of its excess of acid, and then of its saline part by
distilled

distilled water, left a selenite, which when dried weighed ʒ ij. and gr. xx. This proportion is greater than in the former experiment, which I attribute to the acid of vitriol having been diluted with water, and its combining on that account in a greater quantity with the calcareous earth of the spar. The saline part by evaporation and crystallization produced ʒij. and gr. xxviii. of salt, composed of small long crystals, like Epsom salts; its taste was bitter and styptic.

This spar, in its natural state, effervesces strongly with rectified acid of salt, produces heat, and totally dissolves in it; the solution is of a fine yellow colour.

Rectified acid of nitre dissolves also this spar with effervescence and heat; but the solution is colourless.

I judged from the foregoing experiments that this spar was composed of calcareous earth, some iron, and a portion of some other earth, which, with acid of vitriol, forms a soluble salt.

EXPERIMENT III.

In order to determine the quantity of calcareous earth this spar contained, I dissolved three drams of it in rectified acid of salt, and by the addition of a sufficient quantity of a solution of tartar of vitriol in water, I obtained
a selenite,

a felenite, which, when washed and dried with a strong heat, weighed ʒ iij. and gr. xxxvi.

Three drams of dried whiting, dissolved in the same acid, and treated in the like manner, afforded ʒ iv. and gr. xviii. of felenite. The whiting was all dissolved, except three grains. The calcareous earth contained in the spar must, by its formation into felenite, be increased in weight in the same proportion as the whiting; and hence it is evident, that three drams of this spar contains ʒ j ff. and gr. xix, of calcareous earth. The remaining part must be the earth above-mentioned, with some iron.

E X P E R I M E N T I V .

In order to judge of the quantity of iron that this spar contained (not having any more of it left) I took the salt of the first experiment, and dissolved it with water, to which I added some acid of salt. I then precipitated the iron in form of Prussian blue with the common alkaline *lixivium* used for that purpose, and thereby obtained sixteen grains of a fine deep-coloured blue. Acid of salt was added in the usual manner, to heighten the colour, by which means nothing but iron was precipitated.

Two drams of common green copperas, treated in the same manner, produced ʒ j. less than two grains of the

fame fort of blue, though not so good. Hence we may conclude, that the salt of the first experiment, which was produced by three drams of spar with acid of vitriol, contained thirteen grains of vitriol of iron.

Prussian blue, made without help of allum, contains nearly half its weight of iron. Hence, from the foregoing experiments, three drams of this spar contain gr. viii. of iron, 3j. and gr. xlix. of calcareous earth, and 3j. gr. iij. of the earth of *sal catharticus amarus*, or perhaps some other earth, which forms, with acid of vitriol, a soluble salt.

The spathose iron ore being frequently found crystallized like the foregoing new spar, and having also a gloss on it, I was willing to try whether it had any affinity with it; but by the following experiments it appears to be of a different nature, not containing any calcareous earth.

The spathose iron ore dissolves almost totally in acid of salt, and the solution is of a deep yellow colour. A solution of tartar of vitriol in water added to it causes no precipitation; and hence it is evident, that it contains no calcareous earth. Acid of vitriol treated with the spathose iron dissolves the whole of it, excepting a few dregs; another proof of its containing no calcareous earth. The acid of nitre dissolves also this spar, and the solution is colourless.

